



Sportsmanlike conduct. Organizers are working to protect the environment at the site of the Olympic Winter Games of 2002.

runoff from nonpoint source pollution.”

The Atlanta Bicycle Campaign (ABC) is also taking measures to help control air pollution during the games by encouraging the use of bicycles for transportation. ACOG and the city of Atlanta are helping the group with publicity and parking, and ABC will staff the bicycle parking lots. “Our goal is to provide access to the Olympics by bicycle,” said Dennis Hoffarth, director of ABC’s Olympic Bicycle Access Project. “Atlanta already has a severe air pollution problem, and this campaign will help with pollution control.

Salt Lake City is also facing the challenge of protecting the environment when it hosts the Winter Olympics in 2002. “The environment has always been a contentious issue [here] because the small mountains around the city contain delicate watersheds,” said John Hoagland, a winter sports and resorts specialist for the U.S. Forest Service, and a member of the Environmental Advisory Committee of the Salt Lake Olympic Organizing Committee.

During preliminary planning, the organizing committee selected two major canyons outside the city to serve as ski venues, but environmental groups protested and the committee withdrew the proposal. “Withdrawing the venues from those canyons calmed down the environmental community,” Hoagland said. “Now the community is more supportive of the Olympics.”

The organizing committee is cooperating with environmental groups through representatives on the advisory committee. A preliminary environmental platform is now in place in which the organizing committee says it “intends to carry on and improve on the environmental progress initiated in Lillehammer.” Plans include requiring contractors to guarantee that the environment will be restored after the games, ensuring that cultural events such as the opening ceremony have an environmental theme or message,

educating students and the community on the importance of a healthy environment to human health, mandating that spectators use mass transit, and contracting with green vendors and green hotels. “The city has always been sensitive to the environment,” Hoagland said, “and Lillehammer cranked up the heat a little bit.”

Airing the Word on Pollution

The American Medical Association (AMA) passed a policy resolution in December 1995 urging its members to help spread the word to health care colleagues, patients, and the public about the negative health effects of indoor and outdoor air pollution. The resolution was proposed by the National Association of Physicians for the Environment (NAPE), which sponsored a conference on 18 November 1994 to examine the impact of air pollution on body organs and systems.

“It is important that people understand that air pollution can affect not only the lungs, but virtually every organ and system in the body,” said John Kimball Scott, an otolaryngologist and president-elect of NAPE, who served as floor manager of the AMA resolution, in a press release announcing its passage.

According to the conference summary, published 20 September 1995, air pollutants can enter the body through various ways—not just by inhalation. They can be absorbed through the skin or ingested by eating food or drinking water that has been contaminated, possibly through bioaccumulation in the food chain. The pollutants in food and water that humans and animals are most likely to be exposed to include pesticides, PCBs, dioxin, and heavy metals such as cadmium, lead, and mercury, says the report. Such pollutants can cause a variety of adverse health effects including respiratory ailments, damage to the blood system leading to anemia or leukemia, heart disease, including hypertension and cardiac arrhythmias, and damage to the urogenital system resulting in kidney disease, bladder cancer, and reproductive problems. In addition, the skeletal system stores heavy metals such as lead that may accumulate over time. During times of bone loss such as pregnancy, lactation, or osteoporosis, the stored toxins may be released back into the body causing health problems, especially in women, newborn children, and senior citizens.

Air pollutants can also cause immune suppression or overstimulate the immune response, which can lead to allergies and immune-mediated diseases. Air pollutants

have also been linked to psychological disorders and toxic damage to the nervous system and the brain, especially in developing fetuses or young children. In addition, air pollutants are thought to have detrimental effects on the reproductive and endocrine systems, but according to the conference summary, these effects require more research to be fully understood. The report points out that certain populations, including children, the elderly, and minorities, are at a higher risk of being affected by air pollutants.

Not only should people be concerned about the direct impact of air pollution on human health, says the report, but they should also be concerned about the adverse effects of air pollution on plants, animals, and ecosystem functions, which affect agriculture, fishing, wildlife, tourism, and recreation. “Human health is inseparable from the health of the natural world,” says the report.

The report emphasizes the need for more research and public education on the consequences of air pollution. “There is no question that air pollution can be a serious public health hazard and that prevention of air pollution will lead to disease prevention,” says the report.

A Knock-out for NSAIDs

Every year millions of Americans take aspirin and other drugs such as ibuprofen and naproxen for relief of headaches and other minor aches and pains, for chronic pain relief of arthritis, and as a preventive against colon cancer and heart attacks. Referred to collectively as nonsteroidal antiinflammatory drugs (NSAIDs), they are the most widely used drugs in human medicine.

Most people who take NSAIDs do not experience severe side effects, although in some people, especially those taking the drugs chronically, NSAIDs can cause stomach ulcers and irritate the stomach’s lining. NSAIDs that retain their positive benefits and do not cause adverse side effects could significantly benefit the individuals taking them.

Collaborative research by investigators at the NIEHS and the University of North Carolina at Chapel Hill (UNC-CH), has produced two strains of transgenic mice that may lead to better NSAID development. The mice should help scientists obtain a clearer idea of how NSAIDs work. “The importance of this research goes beyond aspirin/NSAIDs,” said Robert Langenbach, a microbiologist at the NIEHS who, with other investigators, developed one of the mouse strains. “It may lead to better treatments and prevention of

diseases like arthritis and, as importantly, colon cancer, because these mice give us a better tool for understanding how these diseases may actually develop," he said.

Langenbach and Scott Morham, an American Cancer Society post-doctoral fellow at UNC-CH, used powerful genetic engineering techniques to eliminate, or "knock out," the genes *Ptgs1* and *Ptgs2* that produce the enzymes cyclooxygenase 1 (COX-1) and cyclooxygenase 2 (COX-2), respectively, in mice. These enzymes are the first enzymes in the prostaglandin biosynthesis pathway.

Prostaglandins, hormone-like compounds, are believed to play a role in cell proliferation, inflammation, and many other biological processes. Scientists had believed that inhibition of COX-1 synthesis by NSAIDs was the cause of the adverse side effects such as occasional stomach upset and more seriously, at higher, continual doses, ulcers and kidney damage. Evidence for this belief was that ingested prostaglandins protected against these effects. Scientists also thought that NSAIDs blocking COX-2 produced the beneficial effects. "NSAIDs inhibit these enzymes. When you knock out the gene, it eliminates the enzyme and that mimics the drugs," Morham said.

However, Langenbach discovered that the mouse lacking COX-1 displayed no ulceration. "Probably the most surprising finding was that the COX-1 knock-out mouse is really quite a healthy animal," he said. "This animal is surviving very well with the basal level of prostaglandins reduced by greater than 99.5%." Given the role prostaglandins are supposed to play, most scientists would have thought that these animals would not have survived. Also surprising was that when the investigators administered one particular NSAID, the mice were more resistant to developing ulcers. "It might suggest that it is the interaction of the enzyme itself with the drug that is causing this ulcerative problem," Morham said.

Morham's mouse lacking COX-2 also displayed an unexpected result. This mouse was able to mount an inflammatory response, but was born with kidney problems. Previously, researchers believed that COX-2 was primarily involved in the inflammatory process, "but our data show that both genes contribute somehow to the process," Langenbach said. "Quite a bit of what we see is contradicting current dogma," Morham added.

"The results," Langenbach said, "suggest that what we know about the role of prostaglandins may have to be modified in terms of how important they are, or that

Doctors and the Environment

"Pollution prevention is disease prevention" is the theme of the National Association of Physicians for the Environment (NAPE), founded in 1992 to help physicians and medical specialty organizations examine the impacts of environmental pollutants on health; educate physicians, patients, and the public about these impacts; and work for the reduction or elimination of environmental pollutants. NAPE also works to involve physicians in global environmental issues such as biological diversity.

NAPE has developed a site on the World Wide Web called "NAPEnet" to provide information about its activities and to make scientific information about health and the environment widely available. Located at <http://intr.net/napenet>, the site offers four major links: About NAPE, What's New on NAPEnet, Documents on NAPEnet, and News Releases.

About NAPE provides the history of NAPE and offers links to a NAPE fact sheet, newsletters, an annual report of activities for 1994, and membership information.

What's New on NAPEnet offers links to recent additions to the site. Among these is a link to *1996 Summer Olympics and Your Health: Sun Protection While at the Olympics*, which offers warnings about the risks of skin damage, eye damage, and potential immune system effects from sun exposure, as well as advice on how to prevent such damage.

Documents on NAPEnet offers links to items such as conference reports and UV index documents. The full text of the conference report, *National Conference: Air Pollution Impacts on Body Organs and Systems Summary of Proceedings* (see Forum article, "Airing the Word on Pollution"), is available under Conference Reports.

News Releases offers press releases about the work of NAPE and its member organizations. For example, there is a link to a press release from 8 December 1995 on the American Medical Association's resolution on the importance of the protection of biodiversity on human health. The release highlights the AMA resolution to encourage its members to take part in a national effort to inform their colleagues, patients, and the public of the importance of protecting biological diversity, particularly because of the value of pharmaceuticals and biologicals that are derived from nature.

NAPE is working to spread the word on environmental health issues through NAPEnet and other outlets because the association maintains that every environmental and pollution problem is, or will become, a medical or public health problem.

EHP online: <http://ehpnet1.niehs.nih.gov>



**National Association
of Physicians
for the
Environment**

there are other pathways and molecules in the body that can compensate for their lack. The therapeutic effect of aspirin-like drugs may be on other gene products rather than these, or in addition to these; we really cannot say."

"Signaling by prostaglandins is very important in almost all biological processes. This research should have an impact on our understanding of how prostaglandin-signaling molecules may be involved in fundamental processes such as the development of colon cancer," said David DeWitt, a biochemist at Michigan State University.

To produce the mice, the investigators used a molecular biology/biotechnology technique developed by Oliver Smithies, a pathologist at UNC-CH in whose laboratory this work was started. The investiga-

tors inactivated the gene of interest, or "knocked it out," in cultured cells. The modified genetic material is inserted into mouse embryonic stem cells. This fragment scans the existing genetic material, locates a matching strand, and binds there. Cells with the altered gene are inserted into a developing mouse embryo and the resulting offspring carry the defective gene. A male and a female mouse with the defect are mated to produce the "knock-out mice." "These mice are highly valuable for studying the function of a gene in a whole animal model," Langenbach said.

Langenbach is continuing to use the mice to study how NSAIDs cause stomach ulcers, and is also studying the role of *Ptgs* genes in the development of various cancers, including colon cancer, and studying

how these genes may interact with other genes to predispose people to cancer.

Morham is looking further at the inflammatory responses of the COX-2 knock-out mice, and is also studying ulceration in these mice. Both researchers hope this work will produce better NSAIDs in the future, as well as benefit patients who take these drugs.

Who Pays to Clean Up Livestock Waste?

Widespread coverage by both the popular and scientific press in the last year pointed out the seriousness of environmental problems associated with livestock waste, particularly waste lagoons. Feces and urine from confinement buildings are typically washed into earthen lagoons, from which they can leak into groundwater at a rate of 500 gallons per acre each day, according to the Washington, D.C.-based Sustainable Agriculture Coalition, a public interest environmental group. Lagoons can also spill directly into surface waters. In the wake of last year's spills that dumped millions of gallons of animal waste into North Carolina and Iowa waterways, Congress recently adopted a bill in the 1996 Farm Act intended to address the livestock waste problem.

Known as the Environmental Quality Incentive Program (EQIP), the bill provides technical assistance to livestock operators such as incentive payments to keep farmers from spraying liquid waste from lagoons along stream banks, and cost-share assistance for building livestock waste facilities. Farmers would be eligible to receive as much as \$10,000 a year with a cap of \$50,000.

In a March letter to Alice Rivlin, director of the Office of Management and Budget, EPA Administrator Carol Browner lauded EQIP and recommended that President Clinton sign the 1996 Farm Bill. EQIP also enjoys overwhelming support in Congress

and is supported by environmental groups, with one caveat. Environmentalists favored the Senate version of EQIP, which had set a limit on the size of farms that are eligible to receive cost-share funds; livestock operations would have to be smaller than those defined as point sources of water pollution in the Clean Water Act (i.e., 1,000 beef cattle, 2,500 hogs, or 100,000 poultry). In contrast, while the version of EQIP that passed prohibits "large confined livestock operations" from receiving these cost-share funds, it stops short of defining "large" and leaves that decision to the discretion of the Secretary of Agriculture.

Some livestock operations can have more than 100,000 beef cattle, 10,000 hogs, and 400,000 chickens. The question being asked is whether operations this large should be eligible for federal cost-sharing funds to build animal waste management facilities. The answer depends on who you talk to. "We support LEAP [the Livestock Environmental Assistance Program, which was the House version of EQIP and set no size limits]," says National Pork Producers Council spokeswoman Deborah Atwood. "This is an environmental bill, not a structure bill. The numbers are irrelevant." LEAP [would] give USDA Secretary Dan Glickman the freedom to protect the most impaired watersheds from the effects of livestock waste, she says. (EQIP also leaves the size of operations eligible for funds to the discretion of the USDA secretary).

Some environmentalist groups disagree. "We think it is a structure issue," says Lonnie Kemp, policy director of the Canton-based Minnesota Project, a nonprofit organization devoted to rural and environmental issues. "Big factory farms get loans and investors and should be able to pay for waste management facilities." However, Kemp does support EQIP for operations smaller than the Clean Water Act limits, saying that financial incentives are an excellent way of encouraging

farmers to minimize their impact on the environment. There are also some dissenters in Congress who, like Kemp, think EQIP should set eligibility size limits. "We should target the money to family farmers," says Mark Rokala, spokesman for Representative David Minge (D-Minnesota). "It can cost \$30,000 to \$50,000 to get feedlots to prevent [environmental] impact, which is significant cost for a guy with 1,000 head of cattle."

A more fundamental question about EQIP is whether waste lagoons are safe for the environment. Again, the answer depends on who you talk to. Waste lagoons are adequate when managed properly but many operators overfill them, making them more likely to spill over, says Deanne Morse, livestock waste management specialist at the University of California at Davis. Others say that waste lagoons are not safe even when managed properly, and that the real issue in livestock waste is large versus small operations. "There is as yet no workable technology for safely dealing with concentrated livestock waste from large operations," says Ferd Hoefner, the Sustainable Agriculture coalition's Washington representative. The coalition favors small family farms because they don't generate huge concentrations of animal waste and therefore can avoid the problem altogether, he says.

In response to concerns about the trend towards ever-increasing concentration in the livestock industry, the USDA appointed an advisory committee in February. The 21-member committee is expected to report on a variety of issues, including the effects of large livestock operations on the environment, by early June.

Rather than help farmers build waste lagoons, the federal government should develop and encourage alternative methods of managing livestock waste, says Paul Sobocinski, a farmer in Wabasso, Minnesota, who is also a staff member of the Land Stewardship Project, based in Marine, Minnesota. Existing alternative methods, which are more feasible for small livestock farms and are widely used in Europe, include dry bedding, which entails keeping the animals on straw and then composting the waste-laden straw.

"I don't need EQIP," says Dwight Ault of Austin, Minnesota, who uses the manure from his 700 hogs to fertilize his crops. "It will benefit the people who are the real polluters and is a short-term fix at best. In the long run it will do more damage than good because it will continue the push for largeness. Bigger is not necessarily better."

Lead and Delinquency

Part of society's recent increase in violence



Pamlico-Tar River Foundation

Cleanup costs. New legislation provides funds for cleanup of livestock waste such as the spills that caused fish kills in Iowa and North Carolina rivers last year.